

Patent Claims

1. Degradable chewing gum polymer,
said degradable polymer being a polymer polymerized from
5 at least one trifunctional or higher functional initiator

at least two different monomers forming the backbone of the polymer and
10 at least one monomer selected from the group of carbonate monomers.
2. Degradable chewing gum polymer according to claim 1,
wherein said at least two different monomers are cyclic.
- 15 3. Degradable chewing gum polymer according to claim 1 or 2,
wherein the at least two different monomers forming the backbone of the polymer
comprises at least one backbone monomer and at least one backbone comonomer,
4. Degradable chewing gum polymer according to any of the claims 1-3,
20 wherein said at least one backbone comonomer imparts disorder in the backbone
monomer chain.
5. Degradable chewing gum polymer according to any of the claims 1-4,
wherein the at least one backbone comonomer is effective to introduce amorphous
25 regions in the backbone monomer chain.
6. Degradable chewing gum polymer according to any of the claims 1-5,
wherein the at least two different monomers forming the backbone of the polymer
are selected from the group of lactone monomers.
- 30 7. Degradable chewing gum polymer according to any of the claims 1-6,

wherein the lactone monomers are chosen from the group of ϵ -caprolactone, δ -valerolactone, γ -butyrolactone, and β -propiolactone, and also includes ϵ -caprolactones, δ -valerolactones, γ -butyrolactones, or β -propiolactones that have been substituted with one or more alkyl or aryl substituents at any non-carbonyl carbon atoms along the ring, including compounds in which two substituents are contained on the same carbon atom and mixtures thereof.

8. Degradable chewing gum polymer according to any of the claims 1-7, wherein the at least one backbone monomer comprises ϵ -caprolactone
9. Degradable chewing gum polymer according to any of the claims 1-8, wherein the at least one backbone monomer has a Tg below -40°C , preferably less than -50°C .
10. Degradable chewing gum polymer according to any of the claims 1-9, wherein the at least one backbone comonomer comprises δ -valerolactone.
11. Degradable chewing gum polymer according to any of the claims 1-10, wherein said degradable polymer is polymerized by metal catalyzed ring-opening.
12. Degradable chewing gum polymer according to any of the claims 1-11, wherein the at least one monomer is selected from the group of carbonate monomers.
13. Degradable chewing gum polymer according to any of the claims 1-12, wherein the at least one monomer selected from the group of carbonate monomers is chosen from the group of trimethylene carbonate, 5-alkyl-1,3-dioxan-2-one, 5,5-dialkyl-1,3-dioxan-2-one, or 5-alkyl-5-alkyloxycarbonyl-1,3-dioxan-2-one, ethylene carbonate, 3-ethyl-3-hydroxymethyl trimethylene carbonate, propylene carbonate, trimethylene carbonate, trimethylolpropane monocarbonate, 4,6-dimethyl-1,3-propylene carbonate, 2,2-dimethyl trimethylene carbonate, and 1,3-dioxepan-2-one and mixtures thereof.

14. Degradable chewing gum polymer according to any of the claims 1-13,
wherein the at least one monomer selected from the group of carbonate monomers
provides a means for introducing additional branching and/or crosslinking to the
elastomeric polymer during ring-opening polymerization.

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15. Degradable chewing gum polymer according to any of the claims 1-14,
wherein said at least one trifunctional or higher functional initiator comprises a
polyol.

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16. Degradable chewing gum polymer according to any of the claims 1-15,
wherein the initiator is selected from the group of glycerol, trimethylolpropane,
pentaerythritol, dipentaerythritol, ethoxylated or propoxylated polyamines and other
molecules with multiple hydroxyl or other reactive groups and other molecules with
multiple hydroxyl or other reactive groups and mixtures thereof.

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17. Degradable chewing gum polymer according to any of the claims 1-16,
wherein the degradable chewing gum polymer is polymerized from:

about 20 to 80 wt % of the at least one backbone monomer,

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about 19.5 to 79.5 wt % of the at least one backbone comonomer,

about 0.5 to 25 wt % of the at least one monomer selected from the group of
carbonate monomers.

18. Degradable chewing gum polymer according to any of the claims 1-17,

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wherein the degradable chewing gum polymer is moreover polymerized from:

about 0.01 to 1.0 wt % of the at least one initiator

19. Degradable chewing gum polymer according to any of the claims 1-18,

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wherein the chewing gum properties of the polymer are adjusted by selection of a
suitable order of the multifunctional initiator.

20. Degradable chewing gum polymer according to any of the claims 1-19, wherein the rheological properties of the degradable polymer is controlled by adjusting the functional number of initiator.

5 21. Degradable chewing gum polymer according to any of the claims 1-20, wherein the lactone monomers are chosen from the group of ϵ -caprolactone, δ -valerolactone, γ -butyrolactone, and β -propiolactone. It also includes ϵ -caprolactones, δ -valerolactones, γ -butyrolactones, or β -propiolactones that have been substituted with one or more alkyl or aryl substituents at any non-carbonyl carbon atoms along the
10 ring, including compounds in which two substituents are contained on the same carbon atom and mixtures thereof.

22. Degradable chewing gum polymer according to any of the claims 1-21, wherein the carbonate monomer is selected from the group of trimethylene
15 carbonate, 5-alkyl-1,3-dioxan-2-one, 5,5-dialkyl-1,3-dioxan-2-one, or 5-alkyl-5-alkyloxycarbonyl-1,3-dioxan-2-one, ethylene carbonate, 3-ethyl-3-hydroxymethyl, propylene carbonate, trimethylolpropane monocarbonate, 4,6-dimethyl-1,3-propylene carbonate, 2,2-dimethyl trimethylene carbonate, and 1,3-dioxepan-2-one and mixtures thereof.

20 23. Degradable chewing gum polymer according to any of the claims 1-22, wherein the molecular weight of lactone monomers are within the range of 50-16000 g/mol preferably within the range of 100-3000 g/mol

25 24. Degradable chewing gum polymer according to any of the claims 1-23, wherein the molecular weight of carbonate monomers are within the range of 50-15000 preferably within the range of 100-2300 g/mol.

30 25. Chewing gum comprising the degradable polymer according to any of the claims 1-24.

26. Chewing gum according to claim 25, wherein

said chewing gum ingredients comprise flavoring agents.

27. Chewing gum according to any of claims 25 or 26, wherein
said flavoring agents comprises natural and synthetic flavorings in the form of
5 natural vegetable components, essential oils, essences, extracts, powders, including
acids and other substances capable of affecting the taste profile

28. Chewing gum according to any of claims 25-27, wherein
said chewing gum comprises flavor in an amount of 0.01 to about 30 wt %, said
10 percentage being based on the total weight of the chewing gum

29. Chewing gum according to any of claims 25-28, wherein
said chewing gum comprises flavor in an amount of 0.2 to about 4 wt %, said
percentage being based on the total weight of the chewing gum

15 30. Chewing gum according to any of claims 25- 29, wherein
said flavor comprises water soluble ingredients.

31. Chewing gum according to any of claims 25-30, wherein
20 said water soluble flavor comprises acids.

32. Chewing gum according to any of claims 25-31, wherein
said flavor comprises water insoluble ingredients.

25 33. Chewing gum according to any of claims 25- 32, wherein
said chewing gum ingredients comprising sweeteners.

34. Chewing gum according to any of claims 25-33,
wherein said sweetener comprises bulk sweeteners

30 35. Chewing gum according to any of claims 25-34,

wherein the chewing gum comprises bulk sweeteners in the amount of about 5 to about 95% by weight of the chewing gum, more typically about 20 to about 80% by weight of the chewing gum.

- 5 36. Chewing gum according to any of claims 25-35, wherein said sweetener comprises high intensity sweeteners

37. Chewing gum according to any of claims 25-36, wherein the high intensity sweeteners comprises sucralose, aspartame, salts of acesulfame, alitame, saccharin
10 and its salts, cyclamic acid and its salts, glycyrrhizin, dihydrochalcones, thaumatin, monellin, sterioside, alone or in combination

38. Chewing gum according to any of claims 25-37,
wherein the chewing gum comprises high intensity sweeteners in an amount of about
15 0 to about 1% by weight of the chewing gum, more typically about 0.05 to about 0.5 % by weight of the chewing gum.

39. Chewing gum according to any of claims 25- 38,
wherein the chewing gum comprises at least one softener.

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40. Chewing gum according to any of claims 25-39,
wherein the at least one softener comprises tallow, hydrogenated tallow,
hydrogenated and partially hydrogenated vegetable oils, cocoa butter, glycerol
monostearate, glycerol triacetate, lecithin, mono-, di- and triglycerides, acetylated
25 monoglycerides, fatty acids - such as stearic, palmitic, oleic and linoleic acids,
waxes, PGE and mixtures thereof.

41. Chewing gum according to any of claims 25- 40,
wherein the chewing gum comprises softeners in the amount of about 0 to about 18%
30 by weight of the chewing gum, more typically about 0 to about 12 % by weight of
the chewing gum.

42. Chewing gum according to any of claims 25- 41, wherein said chewing gum ingredients comprise active ingredients.

43. Chewing gum according to any of claims 25- 42, said active ingredients being
- 5 selected from the group of: Acetaminophen, Acetylsalicylsyre Buprenorphine
Bromhexin Celcoxib Codeine, Diphenhydramin, Diclofenac, Etoricoxib, Ibuprofen,
Indometacin, Ketoprofen, Lumiracoxib, Morphine, Naproxen, Oxycodon, Parecoxib,
Piroxicam, Pseudoefedrin, Rofecoxib, Tenoxicam, Tramadol, Valdecocixb,
Calciumcarbonat, Magaldrate, Disulfiram, Bupropion, Nicotine, Azithromycin,
- 10 Clarithromycin, Clotrimazole, Erythromycin, Tetracycline, Granisetron,
Ondansetron, Prometazin, Tropisetron, Brompheniramine, Ceterizin, Ieco-Ceterizin,
Chlorcyclizine, Chlorpheniramin, Chlorpheniramin, Difenhydramine, Doxylamine,
Fenofenadin, Guaifenesin, Loratidin, des-Loratidin, Phenyltoloxamine, Promethazin,
Pyridamine, Terfenadin, Troxerutin, Methyldopa, Methylphenidate, Benzalcon.
- 15 Chloride, Benzeth. Chloride, Cetylpyrid. Chloride, Chlorhexidine, Ecabet-sodium,
Haloperidol, Allopurinol, Colchicine, Theophylline, Propanolol, Prednisolone,
Prednisone, Fluoride, Urea, Miconazole, Actot, Glibenclamide, Glipizide,
Metformin, Miglitol, Repaglinide, Rosiglitazone, Apomorfin, Cialis, Sildenafil,
Vardenafil, Diphenoxylate, Simethicone, Cimetidine, Famotidine, Ranitidine,
- 20 Ratinidine, cetrimin, Loratadine, Aspirin, Benzocaine, Dextrometorphan, Ephedrine,
Phenylpropanolamine, Pseudoephedrine, Cisapride, Domperidone, Metoclopramide,
Acyclovir, Dioctylsulfosucc., Phenolphthalein, Almotriptan, Eletriptan, Ergotamine,
Migea, Naratriptan, Rizatriptan, Sumatriptan, Zolmitriptan, Aluminium salts,
Calcium salts, Ferro salts, Silver salts, Zinc-salte, Amphotericin B, Chlorhexidine,
- 25 Miconazole, Triamcinolonacetone, Melatonin, Phenobarbital, Caffeine,
Benzodiazepine, Hydroxyzine, Meprobamate, Phenothiazine, Buclizine,
Brometazine, Cinnarizine, Cyclizine, Difenhydramine, Dimenhydrinate, Buflomedil,
Amphetamine, Caffeine, Ephedrine, Orlistat, Phenylephedrine, Phenylpropanolamin,
Pseudoephedrine, Sibutramin, Ketoconazole, Nitroglycerin, Nystatin, Progesterone,
- 30 Testosterone, Vitamin B12, Vitamin C, Vitamin A, Vitamin D, Vitamin E,
Pilocarpin, Aluminiumaminoacetat, Cimetidine, Esomeprazole, Famotidine,

Lansoprazole, Magnesiumoxide, Nizatide and/or Ratinidine or derivates and mixtures thereof.

44. Chewing gum according to any of claims 25-43, wherein the chewing gum is
5 substantially free of non-biodegradable polymers

45. Chewing gum according to any of claims 25-44,
wherein the chewing gum comprises filler.

10 46. Chewing gum according to any of claims 25- 45,
wherein the chewing gum comprises filler in an amount of about 0 to about 50% by
weight of the chewing gum, more typically about 10 to about 40 % by weight of the
chewing gum.

15 47. Chewing gum according to any of claims 25-46,
wherein the chewing gum comprises at least one coloring agent..

48. Chewing gum according to any of claims 25-47, where the chewing gum is
coated with an outer coating.

20 49. Chewing gum according to any of claims 25-48, wherein the outer coating is a
hard coating.

50. Chewing gum according to any of claims 25-49, wherein the hard coating is a
25 coating selected from the group consisting of a sugar coating and a sugarless coating
and a combination thereof.

51. Chewing gum according to any of claims 25-50, wherein the hard coating com-
prises 50 to 100% by weight of a polyol selected from the group consisting of
30 sorbitol, maltitol, mannitol, xylitol, erythritol, lactitol and isomalt.

52. Chewing gum according to any of claims 25-51, wherein the outer coating is an edible film comprising at least one component selected from the group consisting of an edible film-forming agent and a wax.
- 5 53. Chewing gum according to any of claims 25-52, wherein the film-forming agent is selected from the group consisting of a cellulose derivative, a modified starch, a dextrin, gelatine, shellac, gum arabic, zein, a vegetable gum, a synthetic polymer and any combination thereof.
- 10 54. Chewing gum according to any of claims 25-53, wherein the outer coating comprises at least one additive component selected from the group consisting of a binding agent, a moisture absorbing component, a film forming agent, a dispersing agent, an antisticking component, a bulking agent, a flavouring agent, a colouring agent, a pharmaceutically or cosmetically active component, a lipid component, a wax component, a sugar, an acid and an agent capable of accelerating the after-chewing degradation of the degradable polymer.
- 15 55. Chewing gum according to any of claims 25-54, wherein the outer coating is a soft coating.
- 20 56. Chewing gum according to any of claims 25-55, wherein the soft coating comprises a sugar free coating agent.
57. Chewing gum according to any of claims 25-56,
- 25 wherein said chewing gum comprises conventional chewing gum polymers or resins.
58. Chewing gum according to any of claims 25-57,
- wherein the at least one biodegradable polymer comprises at least 5% of the chewing gum polymers.
- 30 59. Chewing gum according to any of claims 25-58,

wherein all the biodegradable polymers comprised in the chewing gum comprises at least 25%, preferably at least 50% of the chewing gum polymers.

60. Chewing gum according to any of claims 25-59,
5 wherein all the biodegradable polymers comprised in the chewing gum comprises at least 80%, preferably at least 90% of the chewing gum polymers.

61. Chewing gum according to any of claims 25-60,
wherein said chewing gum comprises
10 - said at least one biodegradable polyester copolymer forming a plasticizer of the chewing gum and
- at least one non-biodegradable conventional elastomer..

62. Chewing gum according to any of claims 25-61,
15 wherein said chewing gum comprises
- said at least one biodegradable polyester copolymer forming an elastomer of the chewing gum and
- at least one non-biodegradable conventional natural or synthetic resin.

- 20 63. Chewing gum according to any of the claims 25-62, wherein said chewing gum comprises

at least one biodegradable elastomer in the amount of about 0.5 to about 70% wt of the chewing gum,

25 at least one biodegradable plasticizer in the amount of about 0.5 to about 70% wt of the chewing gum and

at least one chewing gum ingredient chosen from the groups of softeners, sweeteners,
30 flavoring agents, active ingredients and fillers in the amount of about 2 to about 80% wt of the chewing gum.

64. Gum base comprising at least one degradable chewing gum polymer according to any of claims 1-24.